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EUGLENOIDS DISTRIBUTION IN RELATION TO WATER QUALITY OF KONANDUR POND, THIRTHAHALLI TALUK, KARNATAKA

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ABSTRACT

Distribution of Euglenoids in Konandur pond of Thirthahalli taluk (Karnataka) has been discussed. They serve as indicators of water quality. A total of 04 species and 02 genera of Euglenophyceae were recorded. *Euglena* and *Phacus* were represented by 2 species each. The physico-chemical parameters were estimated as per standard methods. The study revealed that, pond water was not much polluted. In the light of standard of water quality recommended by BIS , the pond water should be used for human consumption and cooking after proper treatment.

Key Words: Euglenoids, Physico-chemical parameters, Konandur pond

I. INTRODUCTION

Euglena is a genus of single-celled flagellate Eukaryotes. It is the best known and most widely studied member of the class Euglenoidea, a diverse group containing some 54 genera and at least 800 species ("The Euglenoid Project: Alphabetic Listing of Taxa".,2014 ; "The Euglenoid Project for Teachers, 2014). Species of Euglena are found in fresh and salt waters. They are often abundant in quiet inland waters where they may bloom in numbers sufficient to color the surface of ponds and ditches green (*E. viridis*) or red (*E. sanguinea*) (Wolosski, Konrad).

Most species of *Euglena* have photosynthesizing chloroplasts within the body of the cell, which enable them to feed by autotrophy, like plants. However, they can also take nourishment heterotrophically, like animals. Since *Euglena* have features of both animals and plants, early taxonomists, working within the Linnaean three-kingdom system of biological classification, found them difficult to classify (Margulis, Lynn, 2007; Keeble, Frederick,1912) . It was the question of where to put such "unclassifiable" creatures that prompted Ernst Haeckel to add a third kingdom to the Animale and Vegetabile of Linnaeus: the Kingdom Protista (Solomon et al., 2005).

No work has been carried out on periodicity and distribution of Euglenoids in Konandur pond of Karnataka. Hence, the present study has carried out and it is helpful for further scientific research.

II.MATERIALS AND METHODS

Study area

Konandur pond of Theerthalli taluk at Shimoga district, Karnataka situated between 13° 27' and 14° 39' North latitude and between 74° 38' and 76° 4' East longitude. This water body is located at a distance of 80 km from Shimoga surrounded by agricultural fields which is utilized by the local people for drinking, irrigation, fishing, laundry etc.

Water quality analysis: Water was sampled on monthly basis, between 8 to 10 am from June 2001 to May 2003. This water samples were collected in good quality polythene bottles. Water temperature was recorded at the sampling site itself. Dissolved oxygen was fixed on the spot itself in BOD bottles. Remaining water quality parameters were estimated as per the standard methods (APHA, 1998).

The water has undergone moderate changes in its physico-chemical properties due to ecological degradation, overflowing of water from adjacent paddy fields and other excessive human activities. In the present

investigation, an attempt has been made to assess the suitability of water for human consumption and domestic purposes.

Estimation of Euglenoids

Planktonic forms were collected by using a plankton net made of bolting silk cloth of meshes of 10 µm fixing a glass bottle of 100 ml at a narrow end. For taking the samples of qualitative analysis, the net was towed for 5 minutes just below the surface of water (Green and Holden, 1960). Tows were restricted to a small area around each sampling point. The samples were immediately transferred to other bottles and preserved by adding 4% formalin as per the practice of Welch (1948). The qualitative estimation was done by taking one ml of sample from the stock samples at each time and repeated 5 times. Uniform distribution was made by agitating the samples thoroughly. Qualitative identification of planktonic organisms was done with the help of monographs and plankton are identified upto species level (Adoni et al., 1985 ; Bharathi and Hegde ,1982 ; Hegde and Bharathi (1985).

III. RESULTS AND DISCUSSION

Water Quality

Table 1 depicted physico-chemical parameters of Konandur pond. The average air temperature of the pond region is 31° C with a minimum of 27° C and a maximum of 36° C were recorded. The average water temperature of the pond shows 28.3° C and the values were fluctuated between 26 and 35° C. The pH of water is 7.1 which is the neutral condition and it was fluctuated between the circum neutral range (6.8-7.3). The turbidity of the pond water was found in the range between 12-20.8 NTU and the average value was 16.03 NTU recorded in Konandur pond. Conductivity of the pond water was fluctuated between 46.2 and 72.12 µmhos/cm and the average was 61.13 µmhos/cm. The average concentration of dissolved oxygen was 4.83 mg/l and the values were ranged between 3.52-6.88 mg/l. The free carbon dioxide in the Konandur pond was fluctuated between 7.8 and 12.4 mg/1 and the average value of carbon dioxide during the study period is 9.52 mg/l. BOD concentration in Konandur pond was fluctuated between 0.68 to 1.62 mg/l and the average BOD was 1.27 mg/l. The average COD value was 9.52 mg /1 while the values were fluctuated between 6.0-12.8 mg/1. The total hardness of the water was fluctuated between 16-28.6 mg/l and the average hardness value in the pond shows 22.53 mg/l. The average value of the total alkalinity in this pond indicates 42.518 mg/l and the range of the value was between 38.66-49.6 mg/l.

The average value of calcium concentration in this pond was 8.03 mg/1 and the range of this parameter was between 6.4-9.96 mg/l. The magnesium concentration in the pond shows less compared to calcium concentration and the average magnesium was 2.46 mg/l and the range of this parameter was between 1.2-3.2 mg/l. The average sulphate concentration shows 6.55 mg/1 and the range of the sulphate from this pond was between 3.6-9.3 mg/l. The average chloride concentration was 12.83 mg/1 and the range of this parameter was between 10-17.6 mg/l. The ammonical nitrogen was 1.22 mg/land the range of this parameter was between 0.6-2.1 mg/l. The nitrate nitrogen of the pond water was fluctuated between 0.12-1.5 mg/l and its average value 0.816 mg/1 recorded. The concentration of the phosphate in the study pond was fluctuated between 0.12-1.6 mg/l and the average value was 0.85 mg/l. The total dissolved solids recorded in this pond and the average value was 55.32 mg/1 and the range of the parameter was found between 48.0-64.2 mg/l (Table 1).

The seasonal variation of the parameters was represented in Table 2. In this table the two years data was represented separately .Among air and water temperatures in 2001-02 slightly high temperature was found in Konandur pond (Table 2). The pH values showed no greater variations among the seasons as well among the years. A little variation among seasons and through out the study period as found in all the parameters .All other parameters exhibited no significant differences among the comparison of the values.

In the light of standard of water quality recommended by BIS (Table 3), the pond water should be used for drinking and cooking after proper treatment. In order to maintain the health of the tank with respect to water quality it is essential that authorities should take immediate step on the following points.

* Washing of clothes and vehicles should be prevented.

* Awareness should be created regarding the impact of water pollution on the human health.

* People should be advised at least to boil the water to disinfect the pathogens before using the water for drinking purpose.

Periodicity of Euglenophyceae

In the present study, 02 genera and 04 species of Euglenoids have been recorded. The forms that occurred in Konandur pond include: *Euglena proxima, Euglena elastica, Phacus astracoides and Phacus undulates.*
Distribution and monthly occurrence of Euglenoids is presented in Figure 1. In Konandur pond, Euglenoids shows less density. The density of the Euglenoids was observed highest in pre and post monsoon compared to other seasons (Table 4).

Zafar (1967), Seenayya (1972) and Venkateswarlu (1986) are of the opinion that temperature plays on important role in regulating the Euglenoid population. According to them, temperature above 27°C favours the abundance of Euglenoids. In the present investigation, the temperature at Konandur pond ranged from 26°C to 35°C and harboured less number of Euglenoids. Therefore, this observation is in partial agreement with that of Zafar (1967), Seenayya (1972), Venkateswarlu (1986) and Zutshi and Khan (1988).

Earlier reports on Euglenophyceae were by Singh (1960), Munawar (1970), Safiq-ur-Rehaman(1998), Hosmani (2008) and Hosmani (2012). These authors have reported that lake waters having high average concentrations of carbon dioxide are dominated by Euglenophyceae. Seenayya(1971) is of the opinion that levels of dissolved oxygen rise when Euglenophyceae are abundant. Water temperature above 32°C and higher concentrations of Nitrates are effective for the growth of these forms. There are limitations for such biased conclusions.

IV.CONCLUSION

The water samples from Konandure pond was collected and analyzed for physic-chemical and Euglenoid composition. In the light of standard of water quality recommended by BIS, the pond water should be used for drinking and cooking after proper treatment. The impact of certain physico-chemical parameters on Euglenophyceae indicates that water quality plays an important role in the distribution of Euglenophyceae in Konandur pond.

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Table 1. Physico-chemical characteristics of Konandur pond with Mean, Standard Error and Range (mg/l, except pH and temperature)

Parameters	2001-2002		2002-2003	
	Mean ± S.E.	Range	Mean ± S.E.	Range
Air temperature	31.66 ± 9.4	27 – 35	30.33 ± 8.75	28 – 36
Water temperature	28.5 ± 8.22	26 – 32	28.16 ± 8.13	26 – 35
pH	7.05 ± 2.04	6.8 – 7.3	7.11 ± 2.05	6.8 – 7.5
Turbidity	15.92 ± 4.59	12.2 – 20.2	16.13 ± 4.65	12 – 20.8
Conductivity	59.72 ± 17.24	46.2 – 72.12	62.53 ± 18.05	56.4 – 70.4
Dissolved oxygen	4.97 ± 1.43	3.82 – 6.88	4.65 ± 1.34	3.52 – 5.98
Free carbon dioxide	9.94 ± 2.86	8.82 – 12.4	9.10 ± 2.62	7.8 – 10.2
Biological oxygen demand	1.23 ± 0.36	0.92 – 1.58	1.27 ± 0.36	0.68 – 1.62
Chemical oxygen demand	9.5 ± 2.74	6.4 – 12.2	9.54 ± 2.75	6 – 12.8
Total hardness	22.64 ± 6.54	16 – 28.6	22.40 ± 6.46	16.4 – 26.5
Total alkalinity	43 ± 12.41	40.44 – 49.66	42.02 ± 12.13	38.66 – 47.7
Calcium	7.75 ± 2.23	6.4 – 9.2	8.31 ± 2.39	6.8 – 9.96
Magnesium	2.07 ± 0.59	1.2 – 2.84	2.83 ± 0.81	2.2 – 3.2
Sulphate	6.68 ± 1.93	4.8 – 8.6	6.40 ± 1.84	3.6 – 9.3
Chloride	13.26 ± 3.82	10.4 – 17.6	12.40 ± 3.58	10 – 15.2
Ammonical nitrogen	1.4 ± 0.41	0.8 – 2.1	1.02 ± 0.29	0.6 – 1.88
Nitrate-Nitrogen	0.75 ± 0.21	0.12 – 1.58	0.87 ± 0.25	0.33 – 1.22
Phosphate	0.78 ± 0.22	0.12 – 0.98	0.91 ± 0.26	0.36 – 1.6
Total dissolved solids	53.7 ± 15.50	48 – 64.2	56.93 ± 16.43	52.2 – 62.4

Table 2. Seasonal variation of physico-chemical parameters of Konandur pond

Parameters	2001-2002			2002-2003		
	Monsoon	Post-monsoon	Pre-monsoon	Monsoon	Post-monsoon	Pre-monsoon
Air temperature	32.75	29.25	32.25	29.5	29.25	33.00
Water temperature	29.0	27.00	30.25	27.5	26.75	29.5
pH	7.175	7.05	7.05	7.15	7.15	7.00
Turbidity	19.9	14.00	12.45	20.35	15.6	13.875
Conductivity	64.615	53.2325	58.065	68.25	61.275	61.34
Dissolved oxygen	4.735	5.97	4.03	4.63	5.3575	4.225
Free carbondioxide	11.9	9.19	8.3	9.65	9.355	8.725
Biological oxygen demand	1.08	1.36	1.395	1.105	1.3225	1.3525
Chemical oxygen demand	10.95	8.45	8.705	11.45	8.48	9.1
Total hardness	26.695	23.05	18.85	24.675	23.7	18.2
Total alkalinity	41.035	42.05	44.45	41.58	40.06	45.935
Calcium	8.645	7.025	8.45	9.605	6.875	7.6
Magnesium	2.41	1.57	2.675	2.9125	2.9275	2.24
Sulphate	7.4	5.565	6.975	7.0125	5.225	7.1
Chloride	11.75	14.00	13.15	13.555	10.5	14.05
Ammonical nitrogen	1.925	1.0575	1.13	0.8875	1.02	1.29
Nitrate-Nitrogen	0.1725	1.115	0.8925	0.825	0.9125	0.98
Phosphate	0.535	0.87	0.7275	0.84	1.185	0.935
Total dissolved solids	51.585	53.655	56.85	56.7	57.255	55.9

Table 4. Seasonal variations of Euglenoids in Konandur pond

2001-2002			2002-2003			2001-2003		
Monson	Pre-monsoon	Post-monsoon	Monsoon	Pre-monsoon	Post-monsoon	Monsoon	Pre-monsoon	Post-monsoon
14	23	23	15	23	25	14	23	24

Table 3. BIS standards for the potability of water

Sl.No.	Parameters	Permissible limit	Maximum limit
1	Turbidity (NTU)	2.5	10
2	pH	7.0-8.5	6.5-9.2
3	Dissolved oxygen	4.0	6.0
4	Total dissolved solids	500	1500
5	Biological oxygen demand	2.0	3.0
6	Total hardness	200	600
7	Chemical oxygen demand	10	-
8	Calcium	75	200
9	Magnesium	30	150
10	Sulphate	200	400
11	Chloride	200	1000
12	Nitrate nitrogen	45	45
13	Phosphate	-	-
14	Conductivity (µmhos)	1000	2250

Source: Central pollution control Board

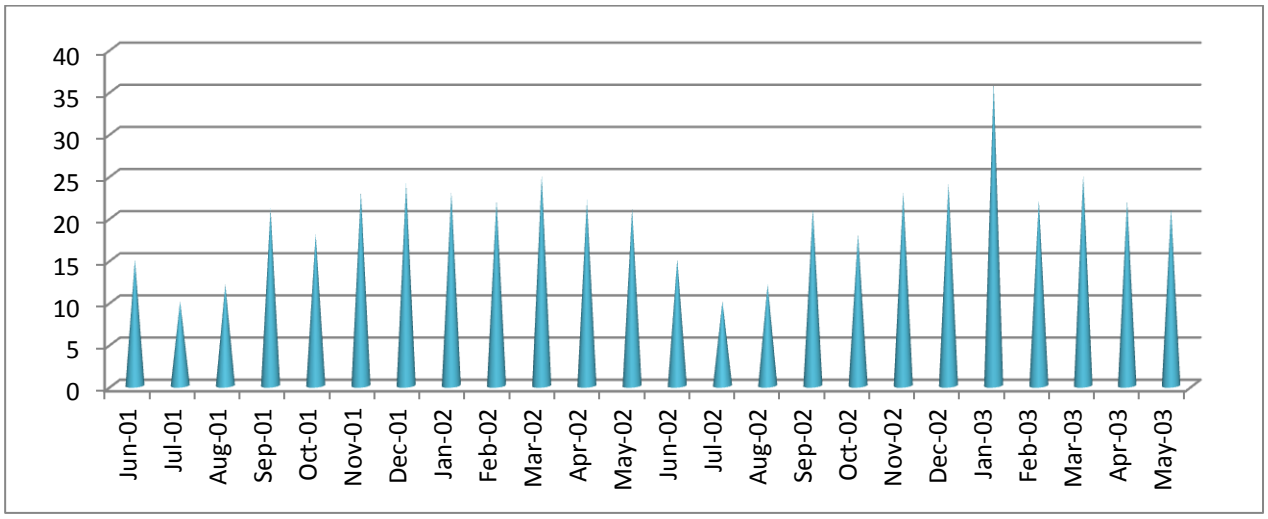

Figure 1: Monthly occurrence of Euglenoids in Konandur pond (org/l) 2001-2003